Sri Lanka Institute of Information Technology

Assignment 2

Data Warehouse and Business Intelligence

2022

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Contents

Data Source for the Assignment 2

The selected data source is a collection of transaction data. This data set reflects donation transactions done by donors. Donors' specific details involved in transactions, Details of schools which receive donations, Rating done by schools, Details of teachers who post projects, Project Details are the key details included in the data set.

The two main sources are listed below:

SQL Database

One text file – Teachers Data

The csv files that were imported to the SQL database are listed below:

Donors Data

Donations Data

Schools Data

Projects Data

Rating Data

Description of the Data Set:

Table name	Column name	Data type	Description
Donors	DonorID	nvarchar(255)	Donor Details
	DonorCity	nvarchar(255)	
	DonorState	nvarchar(255)	
	DonorZip	float	
Projects	ProjectID	nvarchar(255)	Project Details
	TeachersID	nvarchar(255)	
	ProjectName	nvarchar(255)	
	ProjectBudget	float	
Rating	Rating_ID	nvarchar(255)	Details of Rating by Schools
	School_ID	nvarchar(255)	
	Reviewed_by	nvarchar(255)	
	Stars	numeric(38,0)	
	Reviewed_Date	datatime	

SchoolDonation	DonationID	nvarchar(255)	Details of Donation Transactions
	DonationRecievedDate	datetime	
	DonationAmount	float	
	ProjectID	nvarchar(255)	
	ResourceQuantity	float	
	ResourceUnitPrice	float	
	ResourceRecievedDate	datetime	
	RatingID	nvarchar(255)	
	DonorID	nvarchar(255)	
Schools	SchoolID	nvarchar(255)	School Details
	SchoolName	nvarchar(255)	
	SchoolMetroType	nvarchar(255)	
	SchoolState	nvarchar(255)	
	SchoolZip	float	
	SchoolCity	nvarchar(255)	
	SchoolCountry	nvarchar(255)	
	SchoolDistrict	nvarchar(255)	
Teachers	TeacherID	varchar(70)	Teachers Details
	TeacherPrefix	varchar(50)	
	TeacherFirstProjectPostedDate	datetime	

Then the data from the source was loaded into the Staging tables which include,
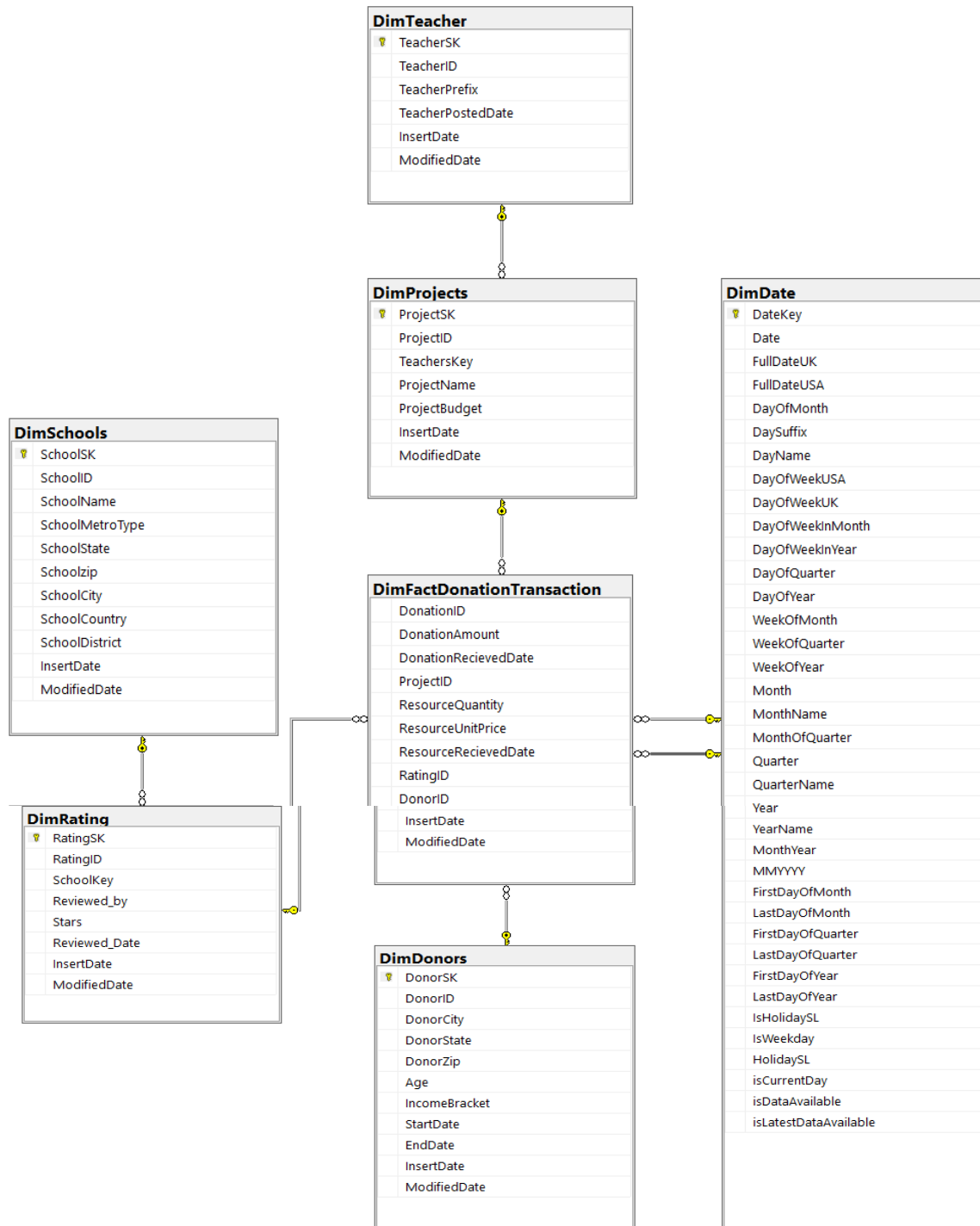
1. stg_Donations
2. stg_Donors
3. stg_Projects
4. stg_Rating
5. stg_Schools
6. stg_Teachers

Then the data was Profiled and Finally the data was transformed and loaded into the Data Warehouse.
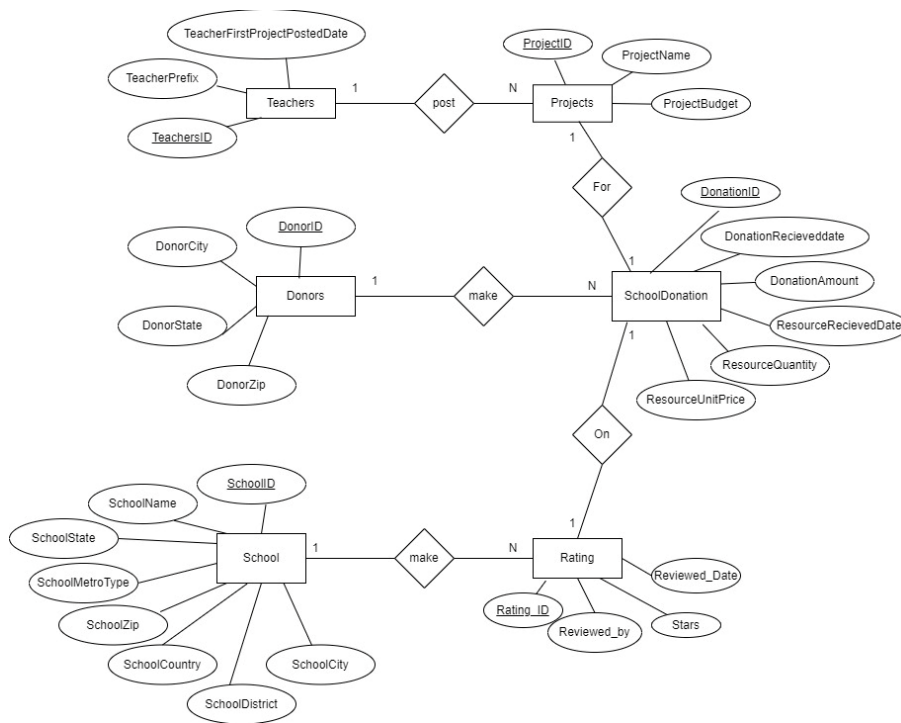
The following dimension tables were generated,

1. DimTeacher
2. DimSchools
3. DimProjects
4. DimDate
5. DimRating
6. DimDonors
7. DimFactDonationTransaction

The Data Warehouse Design and Development Diagram after loading the data into the dimension table is attached below,

DimTeacher
- TeacherSK
- TeacherID
- TeacherPrefix
- TeacherPostedDate
- InsertDate
- ModifiedDate

DimProjects
- ProjectSK
- ProjectID
- TeachersKey
- ProjectName
- ProjectBudget
- InsertDate
- ModifiedDate

DimSchools
- SchoolSK
- SchoolID
- SchoolName
- SchoolMetroType
- SchoolState
- Schoolzip
- SchoolCity
- SchoolCountry
- SchoolDistrict
- InsertDate
- ModifiedDate

DimFactDonationTransaction
- DonationID
- DonationAmount
- DonationRecievedDate
- ProjectID
- ResourceQuantity
- ResourceUnitPrice
- ResourceRecievedDate
- RatingID
- DonorID
- InsertDate
- ModifiedDate

DimRating
- RatingSK
- RatingID
- SchoolKey
- Reviewed_by
- Stars
- Reviewed_Date
- InsertDate
- ModifiedDate

DimDonors
- DonorSK
- DonorID
- DonorCity
- DonorState
- DonorZip
- Age
- IncomeBracket
- StartDate
- EndDate
- InsertDate
- ModifiedDate

DimDate
- DateKey
- Date
- FullDateUK
- FullDateUSA
- DayOfMonth
- DaySuffix
- DayName
- DayOfWeekUSA
- DayOfWeekUK
- DayOfWeekInMonth
- DayOfWeekInYear
- DayOfQuarter
- DayOfYear
- WeekOfMonth
- WeekOfQuarter
- WeekOfYear
- Month
- MonthName
- MonthOfQuarter
- Quarter
- QuarterName
- Year
- YearName
- MonthYear
- MMYYYY
- FirstDayOfMonth
- LastDayOfMonth
- FirstDayOfQuarter
- LastDayOfQuarter
- FirstDayOfYear
- LastDayOfYear
- IsHolidaySL
- IsWeekday
- HolidaySL
- isCurrentDay
- isDataAvailable
- isLatestDataAvailable

ER Diagram

SSAS Cube Implementation

First a Data Source was created to extract data from the School_Donations_DW database in which the the dimension tables are stored.

Next a Data Source view was created for the Data Source mentioned above. An image of the Data Source view created is attached below:
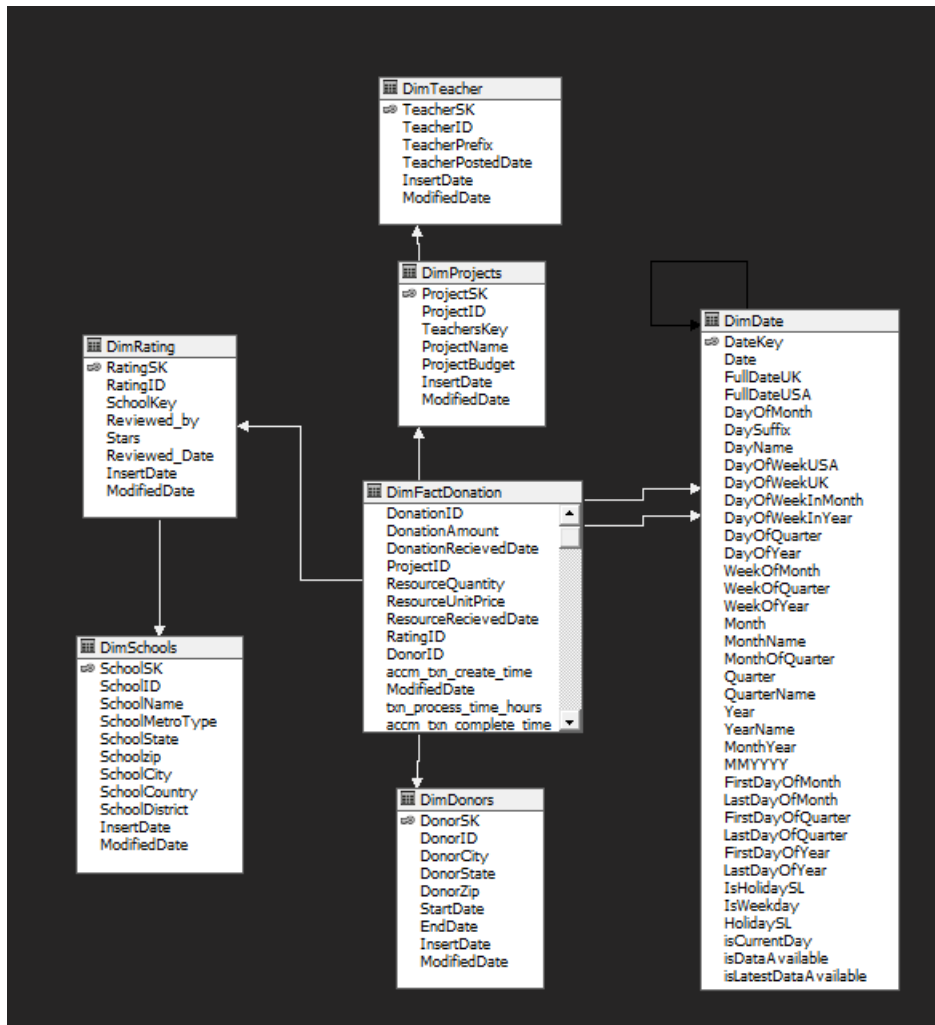

Next by using the Data source view created above, a SSAS cube was created by selecting the DimfactDonation Dimension as the Measure group table. DimDonors, DimRating and DimDate were the dimensions included in the cube. DimSchools and DimRating is the hierarchy implemented in this cube.

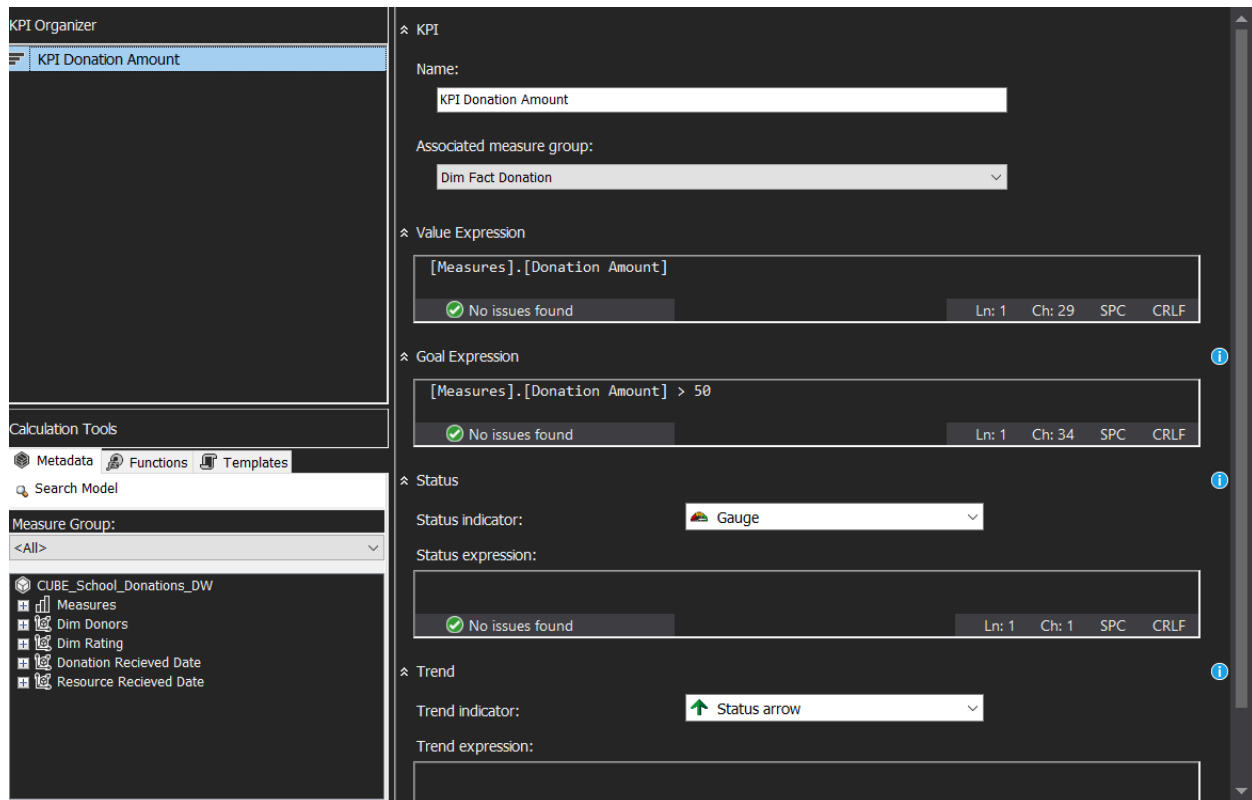The image below depicts the implemented SSAS cube:
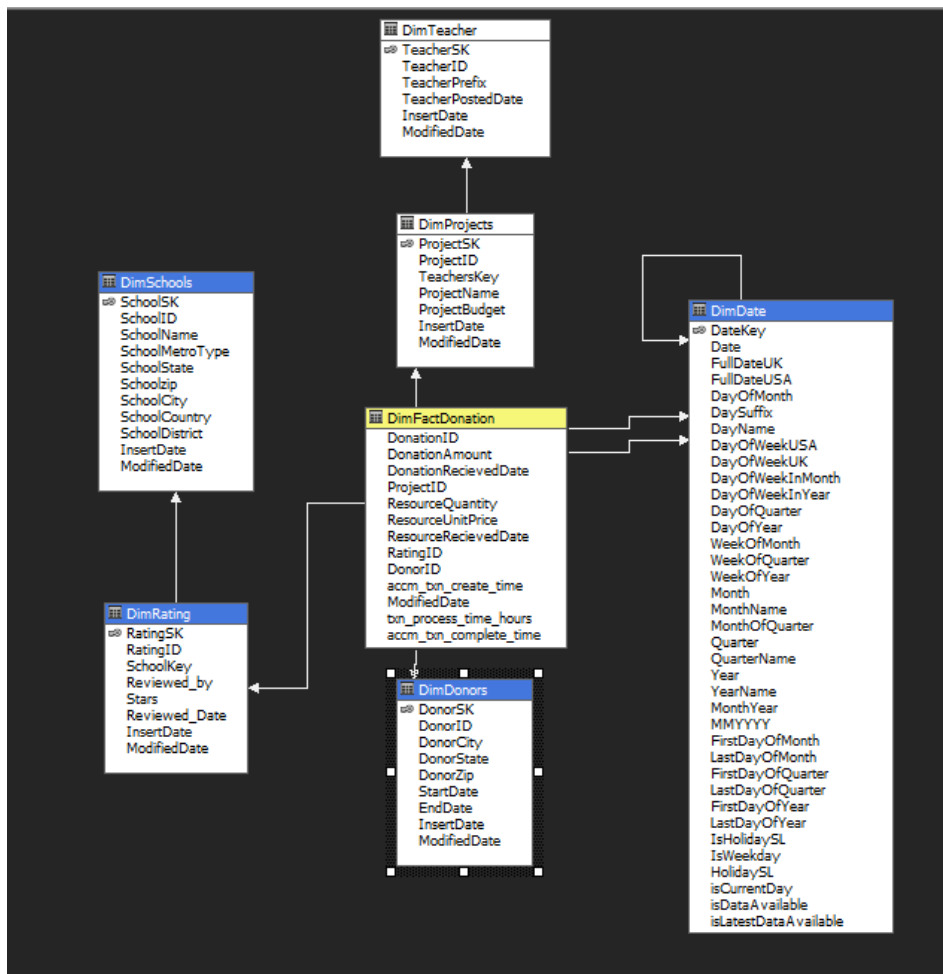
Finally, the SSAS cube was deployed on the Microsoft SQL Analysis services. The image below shows the successful deployment of the cube.
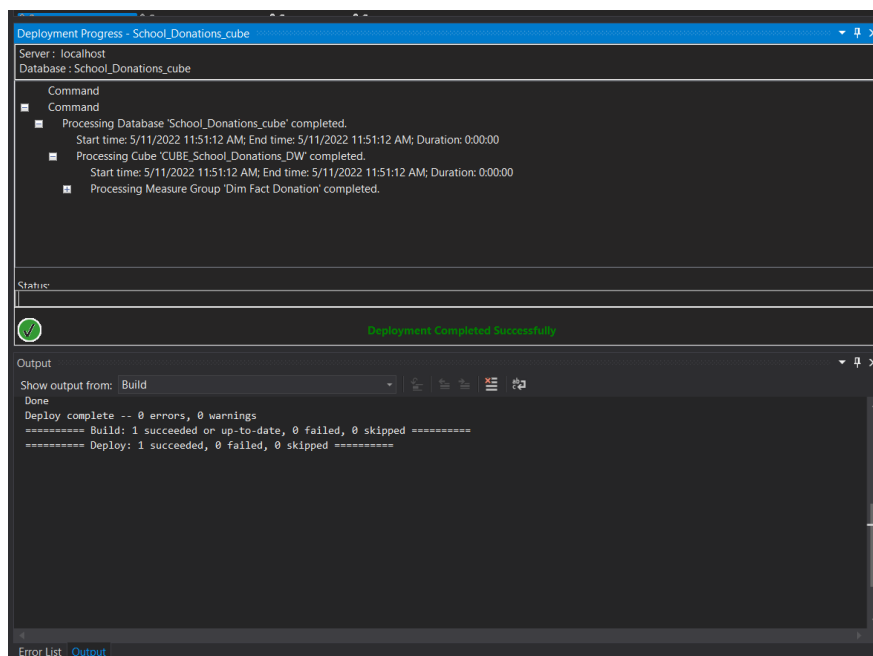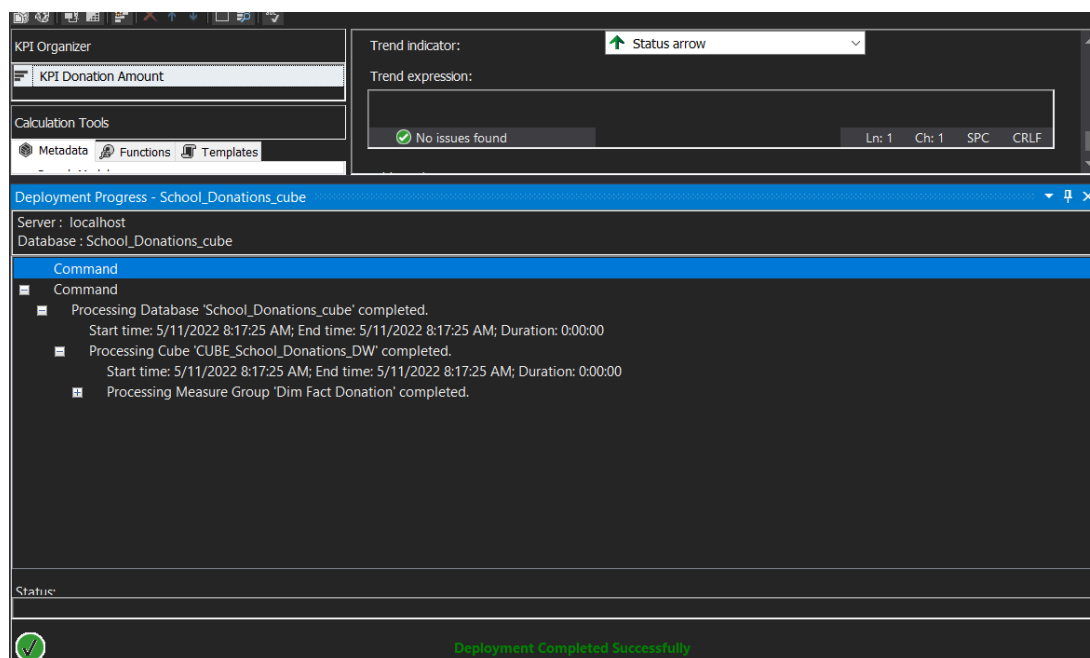
Then by using this implemented cube a KPI was created to find whether each donation made is above $50 to get an understanding of which donor is actively donating on schools.

The image below shows the successful creation of the KPI,

The image below depicts the successful deployment of the KPI,

The image below shows the representation of the KPI in the Microsoft SQL Analysis services to find which donor is active in donating on schools;

Demonstration of OLAP Operations

Roll-up

The OLAP operation Roll up was implemented by climbing up along the dimension hierarchy. Beginning from the School name to the School City then School District followed by School state and then country.

This will enable us to get a clear picture of whether the project budget would satisfy the purchase of adequate resources needed to make the project a success. From the diagram generated below an overall idea of which school from which exact location can complete the project successfully from the

budget designed by them. And which school requires additional donations to make their projects a success which would affect the development of a school's education. The image below depicts the Roll-up OLAP operation:

Drill-Down

The OLAP operation drill-down was implemented to get a detailed view in the dimension hierarchy. Beginning from the Quarter of a year to the Months in the quarter then weeks of a month followed by the days of a week.

This will enable us to get a clear picture of the donations received for the projects in a timely basis. We can analyze which project received the highest donation which will be the most popular among donors and create similar projects in the future to attract donors and the develop the education sector of different countries. Further we can analyze which time range of the year is the most donations received and create more projects during that period. The images below depict the Drill-Down OLAP operation:

Sum of DonationAmount	Column Labels						
Row Labels	A Gift That Triples	A Little for a Lot	Adventures in Chemistry: Hot Plates for All	Amp Up the Reading Rigor	Art Club Anti-Bullying Campaign!	Bonkers Over Bool
⊟1						
⊟January						
⊟1						
Friday	61	102	38	126	88	61.
Saturday	142	131	73	350	42.5	
Thursday	232.09	185	85.71	225	106.44	
Tuesday	112.63	54	95	261	1108.45	
Wednesday	22	101	227	60.58	99	
⊟2						
Friday	127	593.66	211	180.8	63.91	
Monday	175	101	5	71	421	2
Saturday	6	281.41	183.99	102	156	1
Sunday	111	215	53	76	106.05	69.
Thursday	156	52	4	390.59	63	
Tuesday	162	32	63	165.48	327	608.
Wednesday	277	76	54	81	147	138
⊟3	1038.14	814.26	1039.08	623.62	978.99	772.
⊟4	787	1014.5	2107.65	847.55	1475.86	911.
⊟5	971	1026.65	676.2	1179.49	1327.56	1080.
⊟February	5158.46	3506.24	5207.75	4368.26	6218.3	4192.
⊟March	3474.89	3827.52	5109.62	4492.73	6096.52	4582.
⊟2						
⊟April	4562.96	3561.73	4723.77	4817.6	4702.2	4098.
⊟June	5805.11	3470.09	6606.43	4504.8	4610.93	4555.
⊟May	3411.31	4693.21	5785.7	4149.71	5301.43	4196
⊟3						
⊟August	4533.05	4867	4296.41	3780.9	4551.77	3738.

Slice

The OLAP operation slice was implemented to get a result based on a request and it represents a two-dimensional view. A result can be obtained by choosing the city in which donors reside, as the request.

This will enable us to get a clear picture of donors from which city is most interested in donating on schools to assist in the development of the education sector. A KPI is used to check whether the donation provided by donors are above the average level of 50 dollars. Therefore, by selecting a city name we can analyze whether the donation amount provided by the donors of that city is above or below the average level. If below we can encourage such cities to provide more donations. The images below depict the Slice OLAP operation:

The image below shows the donation amounts of all cities:

Row Labels	False	True	Grand Total
Abbeville	52	260	312
Aberdeen	20	809.88	829.88
Abernathy	0	100	100
Abilene	10	496.71	506.71
Abingdon	20	250	270
Abington	0	328	328
Abita Springs	1	0	1
Absecon	0	134	134
Accident	50	0	50
Accokeek	0	120	120
Ackley	25	0	25
Acton	0	280	280
Acushnet	0	60.24	60.24
Acworth	0	1976.38	1976.38
Ada	70	473.98	543.98
Adairsville	26	0	26
Adams	25	0	25
Addison	0	215	215
Adel	0	271.82	271.82
Adena	20	0	20
Adkins	1	0	1
Adrian	25	0	25
Advance	0	101	101
Afton	39	0	39
Agawam	0	105	105
Agoura Hills	0	834	834

The image below shows the donation amounts of the city Abingdon, Breckenridge, Breinigsville, Chisago City and Glenham:

Sum of MeasuresDonation Amount	Column Labels		
Row Labels	False	True	Grand Total
Abingdon	20	250	270
Breckenridge	50	168.66	218.66
Breinigsville	50	0	50
Chisago City	0	1033.89	1033.89
Glenham	25	0	25
Grand Total	145	1452.55	1597.55

Dim DonorsDonor...

- Breaux Bridge
- Breckenridge
- Brecksville
- Breezy Point
- Breinigsville
- Bremen
- Bremerton
- Brenham

Dice

The OLAP operation dice was implemented to get a result based on a number of request. A result can be obtained by choosing the School Name, Project Budget and the Name of the Quarter of the year.

This will enable us to get a clear picture of the schools' project budget for selected quarter of the year. We can analyze which school has prepared the most effective project budget in which quarter of the year in order make the projects successful. We can decide in which quarter of the year does most of the schools prepare their budget. The image below depicts the Dice OLAP operation:

SchoolName	First	Fourth	Total
El Valor Carlos Cantu Children and Family Center	1,372,029.00	1,372,029.00	1,372,029.00
30th Ave School - Middle School	1,372,029.00		1,372,029.00
68th Street Elementary School	1,372,029.00	1,372,029.00	1,372,029.00
A A Nelson Elementary School	1,372,029.00		1,372,029.00
A B Davis Middle School		1,372,029.00	1,372,029.00
A C Moore Elementary School		1,372,029.00	1,372,029.00
A K Suter Elementary School	1,372,029.00		1,372,029.00
A Philip Randolph Campus High School	1,372,029.00		1,372,029.00
Total	1,372,029.00	1,372,029.00	1,372,029.00

SchoolName
- ☐ A J Katzenmaier Academy
- ☒ El Valor Carlos Cantu Children and Family...
- ☐ I-Team Estate
- ☒ Mark Twain Elementary School
- ☐ 1st Sergeant Kevin A Dupont Memorial ...
- ☐ 30th Ave School - Elementary
- ☒ 30th Ave School - Middle School
- ☐ 3rd Street Elementary School
- ☐ 4th Street Elementary School
- ☒ 68th Street Elementary School
- ☐ 99th Street Elementary School
- ☐ 9th Street Elementary School
- ☒ A A Nelson Elementary School

QuarterName
- ☐ (Blank)
- ☒ First
- ☒ Fourth
- ☐ Second
- ☐ Third

ProjectBudget
18,961.79   49,854.00

Pivot

The OLAP operation pivot was implemented to change the axis to facilitate the analysis.

This will enable us to get a clear picture of the date in which the ratings were made on projects and by whom. We can analyze who is more interested in the pros and cons of the projects by rating and when is the highest rating made. The Reviewed_by row is transferred into a column to get the sum of rating made by Principal, Teacher and Chairman of the school. The image below shows the matrix before pivot operation:

ABC Reviewed_by	1.2 Stars	Reviewed_Date
Principal	5	7/30/2013 12:00:00 AM
Principal	1	7/12/2013 12:00:00 AM
Principal	5	11/6/2013 12:00:00 AM
Principal	1	12/31/2013 12:00:00 AM
Principal	5	12/13/2013 12:00:00 AM
Principal	5	7/29/2013 12:00:00 AM
Principal	5	11/3/2013 12:00:00 AM
Principal	1	10/2/2013 12:00:00 AM
Principal	3	6/11/2013 12:00:00 AM
Principal	4	9/29/2013 12:00:00 AM
Principal	5	3/29/2013 12:00:00 AM
Principal	2	2/19/2013 12:00:00 AM
Principal	3	3/29/2013 12:00:00 AM
Principal	2	4/1/2013 12:00:00 AM
Principal	2	4/23/2013 12:00:00 AM
Principal	1	6/15/2013 12:00:00 AM
Principal	5	7/26/2013 12:00:00 AM
Principal	4	12/21/2013 12:00:00 AM
Principal	2	9/19/2013 12:00:00 AM
Principal	5	1/1/2013 12:00:00 AM
Principal	5	3/20/2013 12:00:00 AM
Principal	5	9/28/2013 12:00:00 AM
Principal	4	1/2/2013 12:00:00 AM
Principal	5	5/22/2013 12:00:00 AM
Principal	2	4/5/2013 12:00:00 AM
Principal	4	9/13/2013 12:00:00 AM
Principal	1	3/13/2013 12:00:00 AM
Principal	4	2/13/2013 12:00:00 AM
Principal	2	7/30/2013 12:00:00 AM

.The image below shows the matrix after the pivot operation:

Reviewed_Date	1.2 Teacher	1.2 Principal	1.2 Chairman
4/21/2013 12:00:00 AM	64	42	34
3/29/2013 12:00:00 AM	48	39	20
7/24/2013 12:00:00 AM	60	52	26
5/14/2013 12:00:00 AM	57	52	28
10/7/2013 12:00:00 AM	47	63	37
12/17/2013 12:00:00 AM	63	41	40
10/1/2013 12:00:00 AM	20	72	45
10/24/2013 12:00:00 AM	51	51	46
8/16/2013 12:00:00 AM	63	59	51
9/8/2013 12:00:00 AM	30	57	19
4/15/2013 12:00:00 AM	41	45	29
7/30/2013 12:00:00 AM	69	53	21
3/12/2013 12:00:00 AM	74	68	12
11/16/2013 12:00:00 AM	46	57	27
2/28/2013 12:00:00 AM	75	56	48
9/14/2013 12:00:00 AM	33	70	50
1/11/2013 12:00:00 AM	54	32	37
1/19/2013 12:00:00 AM	56	52	24
9/25/2013 12:00:00 AM	55	67	42
12/23/2013 12:00:00 AM	78	79	50
11/10/2013 12:00:00 AM	63	56	21
3/6/2013 12:00:00 AM	58	62	17
11/7/2013 12:00:00 AM	60	53	23
6/14/2013 12:00:00 AM	40	34	33
7/13/2013 12:00:00 AM	66	51	51
2/20/2013 12:00:00 AM	58	36	40
8/5/2013 12:00:00 AM	43	85	24
5/25/2013 12:00:00 AM	66	69	37

SSRS Reports

Report 1 – Report with a matrix

School Project summary report gives an overall idea of the projects hosted by schools. The projects hosted by each school the budget per project and the Total Resource amount needed to make the project a success and the rating per project can be analyzed using this report. Total resource amount is a calculated field by multiplying the resource quantity and the resource unit price. We can analyze whether the project budget is adequate to purchase the required resources or whether further donations are needed. Which projects are the most successful with the highest rating and the projects with the least rating with drawbacks. Take necessary measures to improve the drawbacks of such projects.

School Project Summary Report

School Name	Project Name	First			Second			Total		
		Project Budget	Total Resource Amount	Stars	Project Budget	Total Resource Amount	Stars	Project Budget	Total Resource Amount	Stars
⊟A Z Kelley Elementary School	Writing Is Our Joy! Help Keep Us Organized	28779	12.37	2	0	0	0	28779	12.37	2
	Total	28779	12.37	2	0	0	0	28779	12.37	2
⊟Albany High School	English Language Listeners!	35671	54.36	2	0	0	0	35671	54.36	2
	Total	35671	54.36	2	0	0	0	35671	54.36	2
⊟Alliance Margaret M Bloomfield High School	Storyworks - From The Classroom To Home	16169	31.68	1	0	0	0	16169	31.68	1
	Total	16169	31.68	1	0	0	0	16169	31.68	1
⊞Anne Frank Inspire Academy	Total	10233	7.26	4	0	0	0	10233	7.26	4
⊞Ball Ground Elementary School	Total	0	0	0	34192	15.51	1	34192	15.51	1
⊞Bell Gardens Elementary	Total	17434	245.7	1	0	0	0	17434	245.7	1

Report 2 – Report with more than one parameter

School wise Project summary report gives an overall idea of the projects hosted by schools. First the school name has to be selected and then the rating stars has to be selected then the details of the project including stars, reviewed by, donation amount, Total Resource amount will be displayed. Total resource amount is a calculated field by multiplying the resource quantity and the resource unit price. We can analyze the donation amount received for projects for a particular school and the Total resource required for the project. Who is more interested on the projects whether principal or teacher or the chairman based on the rating. We can further analyze how can the donations of each school can be raised if it is inadequate to improve the facilities and education of a particular school.

School wise Project Summary

Reviewed by	Stars	Donation Amount	Total Resource Amount
Chairman	39	672.15	1660.41
Principal	30	194.91	1188.41
Teacher	24	336	360.97

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Report 3 – Create an SSRS drill-down report

School Country and Quarter wise Resources Utilized Report will give a clear picture of the resources utilized by each project hosted by which school from which country. Total resource amount is a calculated field by multiplying the resource quantity and the resource unit price. We can analyze which school has the most number of projects hosted and schools which has the least number of projects hosted. The project which has utilized the highest resources and the project which has utilized the least resources. The country which has invested more on developing their education sector can be analyzed. Further the country which has least no of projects can startup new projects by collecting more donations to improve the education sector.

## School Country and Quarter wise Resources Utilized Report

School Country	School Name	Project Name	First			Fourth			Second			Third	
			Resource Quantity	Resource Unit Price	Total Resource Amount	Resource Quantity	Resource Unit Price	Total Resource Amount	Resource Quantity	Resource Unit Price	Total Resource Amount	Resource Quantity	
⊟Adams	⊟Bennett Elementary School	Come Read UPFRONT	0	0	0	1	5.99	5.99	0	0	0		
		Total	0	0	0	1	5.99	5.99	0	0	0		
	Total		0	0	0	1	5.99	5.99	0	0	0		
⊟Alameda	⊟Albany High School	English Language Listeners!	1	54.36	54.36	0	0	0	0	0	0		
		Total	1	54.36	54.36	0	0	0	0	0	0		
	⊟North Oakland Community Charter School	Writing Is Our Joy! Help Keep Us Organized	0	0	0	0	0	0	0	0	0		
		Total	0	0	0	0	0	0	0	0	0		
	⊟Sunol Glen School	Classroom Makeover!	0	0	0	1	329.99	329.99	0	0	0		
		Total	0	0	0	1	329.99	329.99	0	0	0		
	Total		1	54.36	54.36	1	329.99	329.99	0	0	0		
⊟Albemarle	Total		0	0	0	1	32.78	32.78	0	0	0		
⊟Allegheny	Total		1	15.25	15.25	0	0	0	1	279.99	279.99		

## Report 4 - Create an SSRS drill-through report

School Project and donation Analysis will give a clear idea of the project budget designed by the schools of a particular city and the donations received. We can analyze whether which city received the highest donations on schools and which city received the least donations on schools. So that they can provide more donations to such cities. We can analyze which city is more interested to develop the facilities and education of their schools. Further we can also analyze Schools of which city has designed the highest budget and the lowest budget. An image of the School Project and donation Analysis report is attached below:
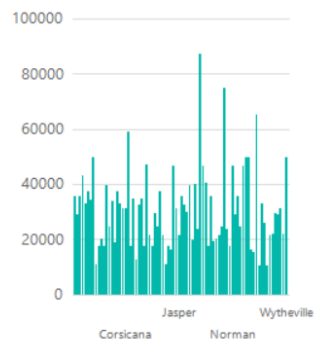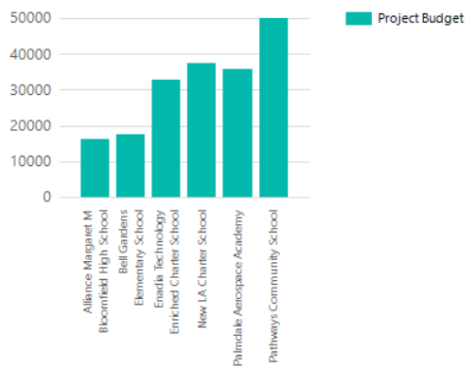

School Project and Donations Analysis
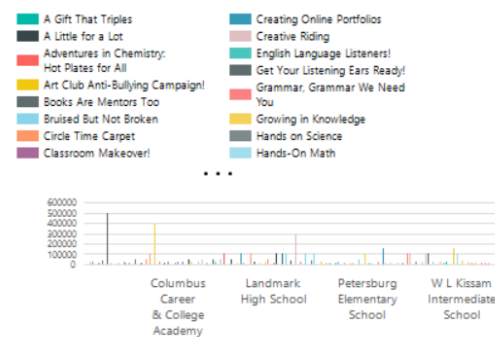
By clicking on one of the cities it would redirect to another report which gives the information of the project budget and donation of the schools in the selected city. We can analyze which school has received the highest amount of donations and the school which has received the least amount of donations so that necessary measures can be taken to increase the donations. Further we can also analyze which School has designed the highest budget and the lowest budget. Which school was successful to collect enough donations when compared to the budget and which school has failed. An image of the School Project and donation Analysis report after clicking on the city Los Angeles is attached below:

School Project and Donations Analysis